

AMENDMENTS TO THE DRAWINGS:

The attached sheet of drawings includes changes to Fig. 4a. This sheet, which includes Figures 3, 4a and 4b, replaces the original sheet including Figures 3, 4a and 4b. The original drawing mistakenly had two elements "60", one such element referring to the threshold has been corrected to "66".

The attached sheet of drawings includes changes to Fig. 8b. This sheet, which includes Figures 8a and 8b, replaces the original sheet including Figures 8a and 8b. The original drawing mistakenly had included element "100", which is not included in the text in reference to Fig. 8b. Accordingly, element "100" has been removed from Fig. 8b.

Attachment: Replacement Sheets

Remarks

Claims 1-15 and 20-26 are currently pending. Claims 5 and 16-19 have been cancelled and claims 23-27 have been added. Claims 1, 3, 9-14 and 20-22 have been amended.

Claims 1-7 and 9-22 were rejected under 35 U.S.C. 103(a) as being unpatentable over Shevy et al. (USPGPUB 2004/0057471) in view of Yao (US 6480637). Claim 8 was rejected under 35 U.S.C. 103(a) as being unpatentable over Shevy in view of Yao, and further in view of DiGiovanni et al. (US 5237576).

Claim 20 was objected to because line 8 should read "resonant cavity". Claim 20 has been so amended.

Claim 22 was objected to as being a substantial duplicate of claim 3. Applicant disagrees in that the scope of the "modulator" in claims 3 and 22 is different, and further in view of present amendments to claim 1. The Examiner also correctly pointed out that claim 22 should depend from claim 20, which case the terms "narrowband fiber grating" and "broadband grating" lack antecedent basis. Claims 22 has been amended to provide proper antecedent basis.

Drawings

The drawings were objected to for failing to include element #66 mentioned in the description at p. 6 in reference to figure 4 and for including element #100 in figure 8b not mentioned in the description. These mistakes have been corrected and replacement sheets are provided herewith.

Specification

The specification was objected to because p. 2, line 14 should read "is oscillated". The specification has been so amended. No new matter has been added.

35 USC § 103(a)

In rejecting claims 1-7 and 9-22, the Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the polarization-dependent laser cavity of Shevy with the modulator of Yao in order to properly control the polarization of the light propagating in the fiber and inherently alter the Q of the cavity due to induced polarization based reflection losses allowing for the storage and release of energy in the gain medium. Applicant disagrees and this rejection is respectfully traversed.

As shown in Figure 5 of Shevy and discussed at paragraph [0037], the reflection spectrum 512 and 521 of FBGs 111 and 121, respectively, are both resolving the reflection bands for the 2 polarization states, and therefore both FBGs are narrowband.

As shown in Figure 1 of Shevy and discussed at paragraph [0032], Shevy discloses a polarization dependent resonator, which employs two FBGs 111 and 121 that are both imprinted on polarization maintaining fibers 110 and 120, respectively. As discussed at paragraph [0027], "the cavity design uses the two waveplates 140 and 170 and the polarization-sensitive reflectors 111 and 121 to eliminate undesired effects of composite cavities that would otherwise be present due to composite cavities formed by the reflectors 111, 121 and grating reflectors in the filter 160 gratings. Thus, having both FBGs 111, 121

imprinted on PM fibers is necessary for Shevy's laser to function properly.

Furthermore, the application of stress to Shevy's polarization resonator would not function properly as a Q-switched laser and would result in a loss of function of Shevy's traveling wave laser. The Examiner must consider the entirety of Shevy's teachings and may not pick and choose elements therefrom.

To function properly, the switching of the Q of the resonant cavity should occur for all of the supported cavity modes in the same manner. The retardance between the stressed non-PM section of fiber, to one of the reflectors, and back to the stressed section should be approximately the same for all the longitudinal modes. If the FBG near the stressed section is imprinted on a PM fiber, the retardance will vary across the modes. Consequently, the Q for all of the modes will not be controlled in the same way, i.e., when one mode becomes high-Q, another wavelength may be low-Q vice versa, so the Q-switching cannot be controlled.

To produce the necessary birefringence to effectuate Q-switching, stress would have to be applied to a non-PM section of Shevy's polarization dependent cavity. It is difficult to generate sufficient birefringence to overcome the natural birefringence of the PM fiber. If stress were applied to waveplate 140, or on single-mode fiber 130 between waveplate 140 and filter grating 161, some effect synchronized with the timing of the stress might occur, but it would be a complex "pulsed" or "modulated" mode of operation in which the principal benefits of Shevy's traveling wave laser would be lost. Lasing would occur between FBG 111 and filter grating 161, and thus the laser

signal would not even pass through filter 160. Furthermore, lasing would occur at the wavelengths at both reflection bands of the FGB 111, which are near 1534 nm and 1534.4 nm in Figure 5, losing its intended functionality of single-frequency operation only near 1534 nm, for the example of Figure 5. Even if the application of stress is optimally positioned, considering the high reflectivity of 111 and 161, the laser pulses build up before the birefringence reaches the ideal value, spatial hole burning cannot be eliminated, thus de-functioning the traveling-wave cavity. Additionally, the entire laser will lase even in the low-Q state, therefore so-called Q-switched pulses having high peak power compared to the pump power cannot be obtained. Further, because lasing occurs between high reflectivity gratings 161 and 111, the lasing starts when the stress is fairly small and the retardance is well below quarter-wave, thus traveling wave operation may not be possible.

Claim 1 as amended recites both narrowband and broadband gratings, which is not taught by Shevy. Furthermore, as discussed above, the combination of Shevy and Yao would not produce a controllable Q-switched laser and would result in critical loss of function of Shevy's Q-switched laser.

Claim 3 as amended further specifies that the broadband grating is formed in a non-PM fiber. Shevy teaches forming both FBG in PM fibers to avoid composite cavity issues.

Claim 11 as amended further specifies that the fiber chain includes only one section of PM fiber. This PM fiber may be the gain fiber, the fiber in which the narrowband grating is printed or a splice of those two fibers. Shevy

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clearly shows two different PM fiber sections in which the FBGs 111 and 121 are formed.

Claim 12 as amended traverses the rejections for the reasons provided in reference to claim 1. In addition, claim 12 specifically recites that the broadband grating is formed in a non-PM fiber and that the stress is applied to that fiber.

Claim 20 as amended traverses the rejections for the reasons provided in reference to claim 1.

Claim 23 recites a pair of FBG at least one of which is formed in a non-polarization maintaining (PM) fiber. This feature is neither taught nor suggested by Shevy. Furthermore, as discussed above, the combination of Shevy and Yao would not produce a controllable Q-switched laser and would result in critical loss of function of Shevy's Q-switched laser.

Conclusion

It is respectfully urged that the subject application is patentable over the cited references and is now in condition for allowance.

The Examiner is invited to call the undersigned at the below listed telephone number if, in the opinion of the Examiner, such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

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